Distribution and Abundance of Dall's Sheep in the Richardson Mountains, August 1997

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ABSTRACT

Aerial block surveys (blocks established in 1984) were conducted on 5, 10, and 11 August 1997 to document the number and distribution of Dall's sheep (*Ovis dalli*) in the Richardson Mountains, Northwest Territories (NWT) and Yukon Territory (YT). Due to inclement weather, three blocks (Millen, Bear, and White) were not surveyed.

We counted and classified 1,344 sheep including 802 nursery sheep, 250 lambs, 286 rams (76 half curl, 74 three-quarter curl and 136 full curl) and 1 unclassified sheep. Total populations size was estimated at 1,730 sheep; this was based on the assumption that the number of sheep in the Millen, Bear, and White blocks had not changed from 1991. The annual rate of increase for the non-lamb portion of the population was 4% per year during 1991 and 1997; the number of full curl rams increased between 1991 and 1997 but the full extent of the increase could not be determined due to poor weather conditions. There were 31.2 lambs per 100 nursery sheep; this suggested a stable or increasing population. Overall, 92% of the sheep were observed in the NWT; however, the three blocks that could not be surveyed were in the YT.

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INTRODUCTION

The Dall's sheep (*Ovis dalli*) in the Richardson Mountains is part of an island population at the northernmost extent of their distribution in Canada (Barichello et al. 1987). These sheep and those in the British Mountains, Yukon Territory (YT) are the only populations in Canada that inhabit ranges north of the Arctic Circle and are exposed to rigorous Arctic environments (Barichello et al. 1987). The Richardson Mountains Dall's sheep population is largely unhunted. Gwich'in and Inuvialuit harvest a small number of sheep, primarily ewes and lambs, each year. Some residents of Aklavik have expressed an interest in conducting guided sheep hunts for non-resident hunters since the late 1980s. The Gwich'in Renewable Resources Board (GRRB), the Department of Environment and Natural Resources (ENR), Government of the Northwest Territories, and the Department of Environment, Yukon Territorial Government currently survey this population every three to five years to monitor population trends and productivity.

A number of surveys of this population were conducted by biologists between 1971 and 1986 (Simmons 1973, Hoffman 1974, Nolan and Kelsall 1977, Hoefs 1978, Males 1980, Latour 1984). Population estimates obtained during these surveys suggested that the population had declined from 447 in 1972 (Nolan and Kelsall 1977) to 68 in 1983 (Latour 1984). Barichello et al. (1987) estimated that there were 543 sheep in the area in 1984. As a result, the suspected decline in sheep numbers between 1972 and 1983 may have been a function of survey methods or area surveyed, or both. Barichello et al. (1987) re-surveyed the area in 1985 and 1986 and found that the population had increased to an estimated 617 sheep in 1985 and 802 in 1986, indicating a period of rapid population growth.

This population was surveyed again in 1991 (Nagy and Carey 2013). These data indicated that the population had continued to increase between 1986 and 1991, but the annual rate of growth had declined. The lamb to nursery sheep ratios were indicative of stable to

increasing populations in 1991. The number of full curl rams in the population increased dramatically from 67 in 1986 to 182 in 1991.

In August 1997, we surveyed the study area established in 1984 (Barichello et al. 1987). There were three primary objectives of this survey:

1. Obtain current estimates of the numbers of lambs, nursery sheep, and rams (half, three-quarter, and full curl) in the populations.
2. Document the distribution of rams in the population during mid to late summer.
3. Obtain information that is required to determine the number and distribution of hunting permits within management zones allowable if limited entry sport hunts occur in the future.

This survey was conducted by ENR, Inuvik, NWT, in cooperation with GRRB, Inuvik, NWT and the Department of Environment, Dawson, YT.

Study Area

The northern Richardson Mountains (67°30' to 68°30' N, 135°30' to 137°W) are in the "Northern Mountains and Coastal Plain" ecological region (Oswald and Senyk 1977) also called the Cordillera ecological region in the NWT (ECG 2010) (Figure 1). The central portion of the area is characterized by sharp ridges, rocky slopes and deep V-shaped valleys, and surrounded by gently rolling terrain. Most of the study area is over 1,500 m above sea level and is composed primarily of sedimentary rock. Permafrost is continuous, temperatures average -9°C annually, and annual precipitation is about 500 mm (Barichello et al. 1987).

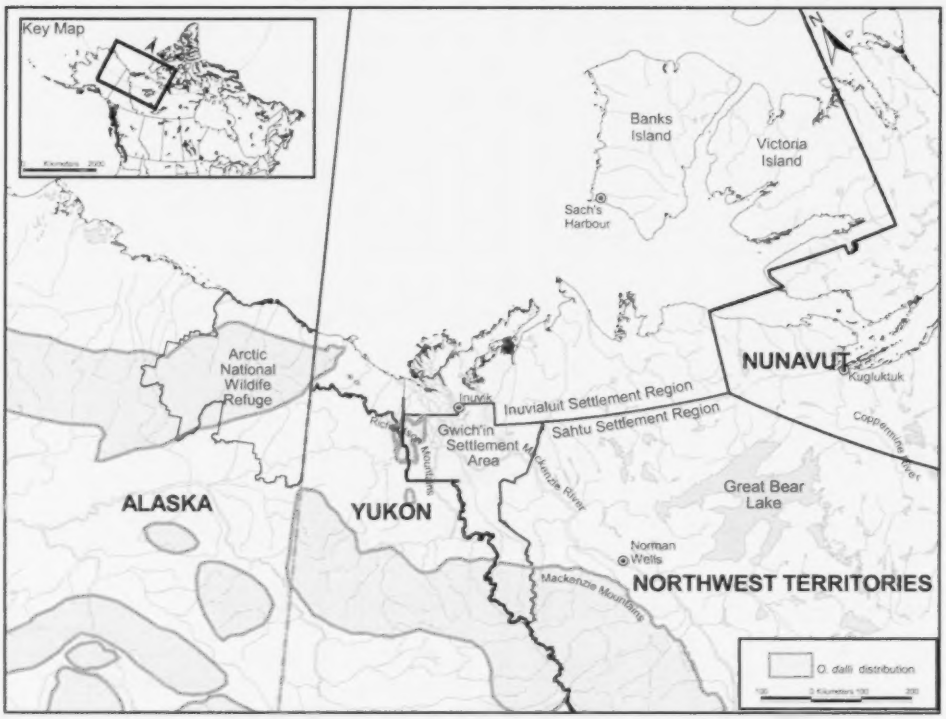

Figure 1. Location of the northern Richardson Mountains Dall's sheep study area.

The study area is approximately 3,000 km^2 (Figure 2). Black spruce (*Picea mariana*) and balsam poplar (*Populus balsamifera*) occur in protected valleys. Tussock tundra (*Carex* spp. and *Eriophorum* spp.) dominates valley bottoms to mid-slopes (Barichello et al. 1987). Alpine vegetation dominates ridge tops at higher elevations. Barichello et al. (1987) suggested that 50% of the area could be considered potential sheep habitat with most of this occurring above the treeline where forage and escape terrain are available.

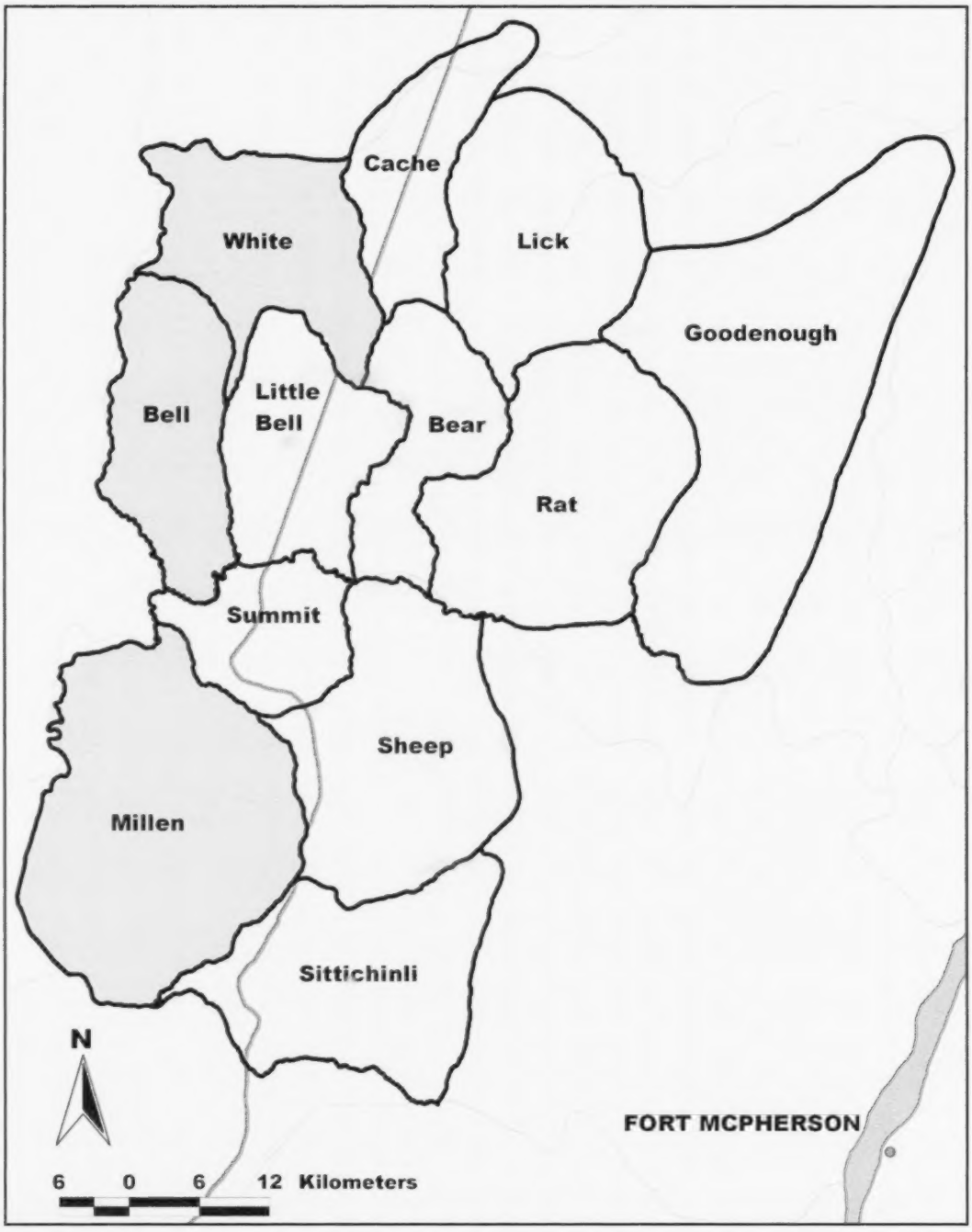

Figure 2. Blocks surveyed in the northern Richardson Mountains, August 1997. Shaded areas were missed due to poor weather.

Moose (*Alces americanus*) occur in low numbers throughout the eastern portion of the study area but are generally found along valley bottoms. The Porcupine caribou herd (*Rangifer tarandus granti*) migrates through the area during spring and autumn (Porcupine Caribou Technical Committee 1993). In some years a portion of this herd summers and winters in the area. A few muskoxen (*Ovibos moschatus*) have been observed.

METHODS

The survey blocks delineated by Barichello et al. (1987) were systematically surveyed (Figure 2). Complete coverage was obtained by contouring mountain blocks and river drainages using a helicopter flying at approximately 100 km/h and 200 m above ground. Sheep were counted and classified by sex and age class as follows: nursery sheep (ewes, yearlings, and two-year-old rams), lambs, and rams (half, three-quarter, and full curl). Nursery groups were classified as yearlings, young rams, and ewes whenever possible. The location of each observation was recorded on 1:250,000 NTS topographic maps. These were digitized to obtain longitude and latitude coordinates for each location. The results of the survey were summarized by survey block and for the population. The exponential rate of change of the population was estimated as follows (Caughley 1980):

$$\log_e e^r = r$$

The number of lambs per 100 nursery sheep was calculated for each survey block and for the study area. We determined the number of lambs, nursery sheep, rams and all sheep that occurred in the NWT and YT during the survey. Maps showing the distribution of lambs, nursery sheep, rams, and all sheep were created in ArcView 3.2 (Environmental Systems Research Institute).

RESULTS

The survey was flown on 5, 10, and 11 August 1997. Weather conditions on 5 August were variable, with broken clouds, high overcast, and variable winds. Due to poor weather conditions we were unable to resume the survey until 10 August when conditions were clear and calm. On 11 August weather conditions were again variable, with high overcast conditions in the morning that turned to low clouds and showers in the late afternoon. On 15 August we terminated the survey due to poor weather conditions. As a result we were unable to survey the Millen, Bear, and White blocks. Appendix A provides details on all sheep observed during the survey.

Population size and trend

A total of 1,344 sheep were counted and classified in nine of the twelve survey blocks. This included 802 nursery sheep, 250 lambs, 286 rams (76 half curl, 74 three-quarter curl, 136 full curl), and 1 unclassified sheep (Tables 1 and 2). If the number of sheep in the blocks that were not surveyed in 1997 remained stable, total population size would be approximately 1,730 sheep (Figure 3). This indicates that the population continued to increase between 1991 and 1997. In 1991 the population size was estimated to be 1,374 sheep, with 1,104 of these occurring in the blocks surveyed in 1997 (Table 4 and 5). As a result, the annual finite rate of increase between 1991 and 1997 in the blocks surveyed in 1997 was 4% (Figure 4). Table 3 gives the composition of sheep in the study areas during surveys conducted during 1984 to 1991.

Table 1. Classification of Dall's sheep by survey block in the northern Richardson Mountains, August 1997.

			Rams					
Survey Block	Nursery Sheep	Lambs	Half curl	Three-quarter curl	Full curl	Total	Un-classified	Total Sheep
Bear	64	15	7	9	13	29	0	**108**
Bell[1]								
Cache	73	16	3	1	5	9	0	**98**
Goodenough	139	52	26	25	37	88	1	**280**
Lick	91	20	0	1	0	1	0	**112**
Little Bell	34	16	4	1	6	11	0	**61**
Millen[1]								
Rat	259	78	25	27	52	104	0	**441**
Sheep	117	40	9	7	18	34	0	**191**
Summit	25	13	2	3	5	10	0	**48**
Sittichinli[2]								
White[1]								
Total	**802**	**250**	**76**	**74**	**136**	**286**	**1**	**1,339**

[1] The White, Bell, and Millen blocks could not be surveyed due to low cloud and fog.
[2] The Sittichinli block was surveyed but no sheep were observed.

Table 2. Demographic characteristics of Dall's sheep by survey block and the northern Richardson Mountains study area, August 1997.

Survey Block	Lambs per 100 nursery sheep	Total Non-Lamb Sheep	Percentage Full Curl Rams of Total Rams	Rams per 100 Nursery Sheep
Bear	23.4	92	44.8	45
Bell[1]				
Cache	21.9	82	55.6	12
Goodenough	37.4	234	42.0	63
Lick	22.0	92	0.0	1
Little Bell	47.1	45	54.5	32
Millen[1]				
Rat	30.1	363	50.0	40
Sheep	34.2	151	52.9	29
Summit	52.0	35	50.0	40
Sittichinli[2]				
White[1]				
Total	31.2	1,094	47.6	36

[1] The White, Bell, and Millen blocks could not be surveyed due to low cloud and fog.
[2] The Sittichinli block was surveyed but no sheep were observed.

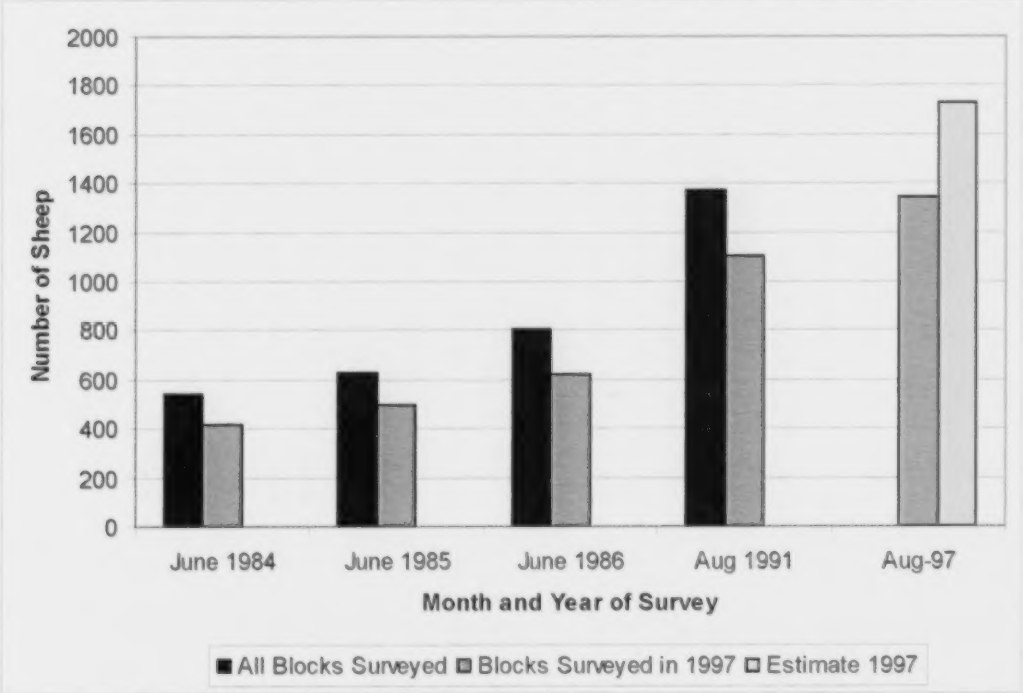

Figure 3. The number of Dall's sheep in the Richardson Mountains population during surveys conducted during the period 1984 to 1997.

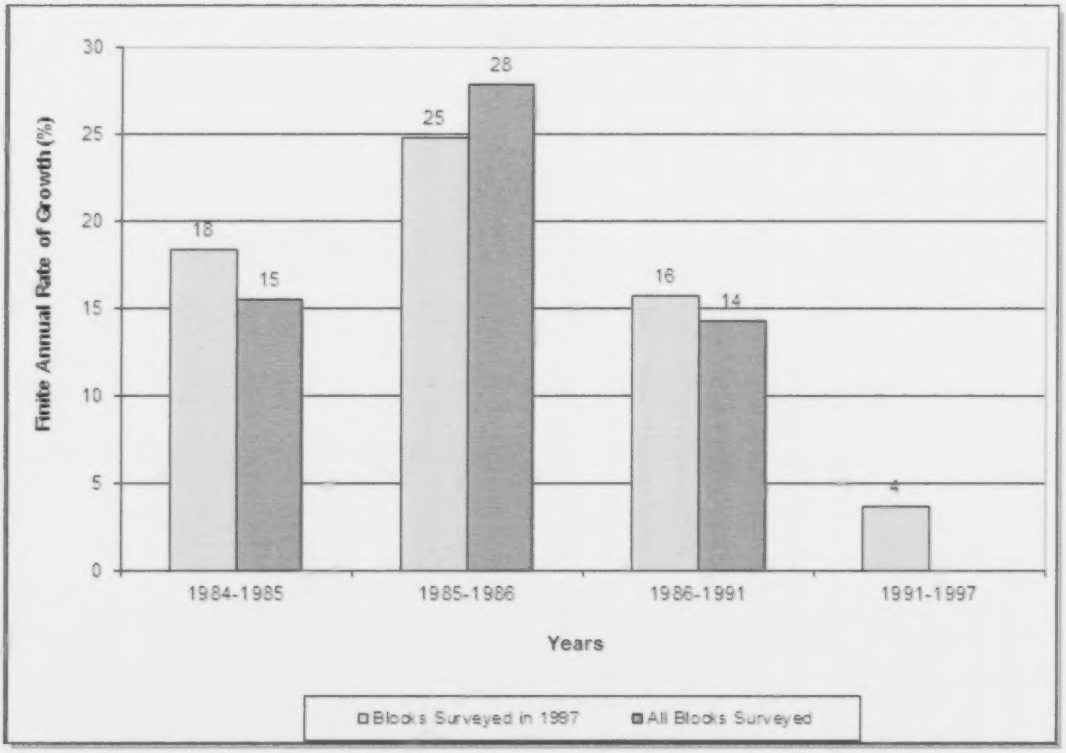

Figure 4. Finite annual rate of population growth for the Dall's sheep population in the Richardson Mountains during the period 1984 to 1997 (rates are based on changes in the number of sheep in the Cache, Lick, Goodenough, Bear, Little Bell, Summit, Rat, Sheep, and Sittichinli blocks only).

Table 3. Number of Dall's sheep by class in the NWT and YT, August 2003.

Year[1]	Class of Sheep	NWT		YT		Total
		No.	Percent	No.	Percent	
1991[2]	Nursery	494	73	184	27	678
	Lambs	215	75	71	25	286
	Half curl ram	65	66	34	34	99
	Three-quarter curl ram	58	63	34	37	92
	Full curl ram	95	52	87	48	182
	Total	**927**	**70**	**410**	**30**	**1,374**
1997	Nursery	746	93	56	7	802
	Lambs	226	90	24	10	250
	Half curl ram	70	92	6	8	76
	Three-quarter curl ram	71	96	3	4	74
	Full curl ram	122	90	14	10	136
	Total	**1,235**	**92**	**103**	**8**	**1,338**

[1] The Bell, Millen, and White blocks were not surveyed in 1997. All blocks were surveyed in 1991, 2001, and 2003.
[2] Nagy and Carey 2013.

Productivity and recruitment

The observed overall productivity of 31.2 lambs per 100 nursery sheep is indicative of a stable to increasing population (Table 5). This value is comparable to most of the lamb to nursery sheep ratios documented during the period 1984 to 1991 (Tables 3 and 4, Figure 5).

The number of rams in the population continued to increase between 1991 and 1997 but the full extent of the increase is not known because all blocks were not surveyed (Tables 4 and 5, Figure 6). The proportion of half and three-quarter curl rams has remained relatively stable (Table 5). The proportion of full curl was similar to that in 1991 (46.2% of rams in 1991 and 47.6% in 1997), but is higher than values recorded during 1984 to 1986 (35.0% to 39.6% of rams) (Table 5, Figure 7).

Table 4. Demographic characteristics of the Dall's sheep population during years when all survey blocks were flown.

	No. by Class				No. per 100 Nursery Sheep		Percentage of Rams		
Year[1]	Lambs	Nursery	Rams	All Sheep	Lambs	Rams	Half Curl	Three-quarter Curl	Full Curl
1984[2]	110	302	131	543	36.4	43.4	36.6	25.2	37.4
1985[2]	117	362	148	627	32.3	40.9	31.1	33.1	34.5
1986[2]	145	460	197	802	31.5	42.8	39.6	25.4	34.0
1991[3]	289	675	373	1374	42.8	55.3	26.5	24.7	48.8

[1] The Bell, Millen, and White blocks were not surveyed in 1997. As a result the 1997 data were not included in this table.
[2] Barichello et al. 1987
[3] Nagy and Carey 2013.

Table 5. Demographic characteristics of Dall's sheep in the Richardson Mountains summarized for only those blocks that were surveyed in 1997.

	No. by Class				No. 100 Nursery Sheep		Percentage of Rams		
Year[1]	Lamb	Nurse	Rams	All Sheep	Lambs	Rams	Half Curl	Three-quarter Curl	Full Curl
1984[2]	87	232	100	419	37.5	43.1	38.0	26.0	35.0
1985[2]	100	295	101	496	33.9	34.2	23.8	34.7	39.6
1986[2]	111	371	137	619	29.9	36.9	35.8	26.3	36.5
1991[3]	246	561	260	1104	43.9	46.3	27.3	26.5	46.2
1997	250	802	286	1344	31.2	35.7	26.6	25.9	47.6

[1] Cache, Lick, Goodenough, Bear, Little Bell, Summit, Rat, Sheep, and Sittichinli blocks were surveyed in 1997.
[2] Barichello et al. 1987
[3] Nagy and Carey 2013.

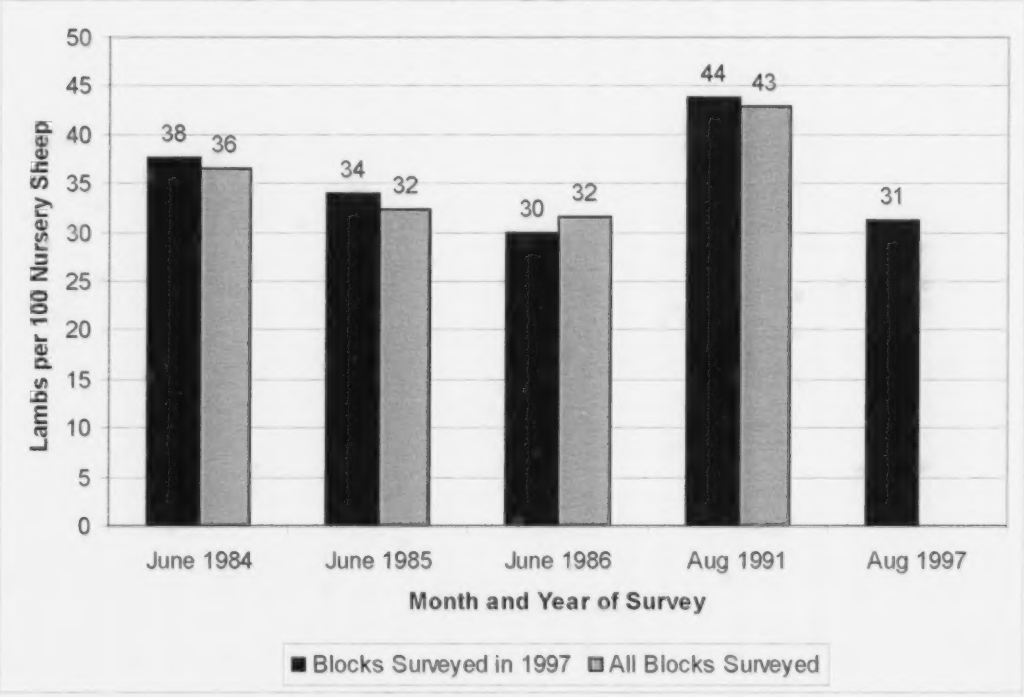

Figure 5. Number of lambs per 100 nursery sheep in the Richardson Mountains Dall's sheep population, 1984 to 1997.

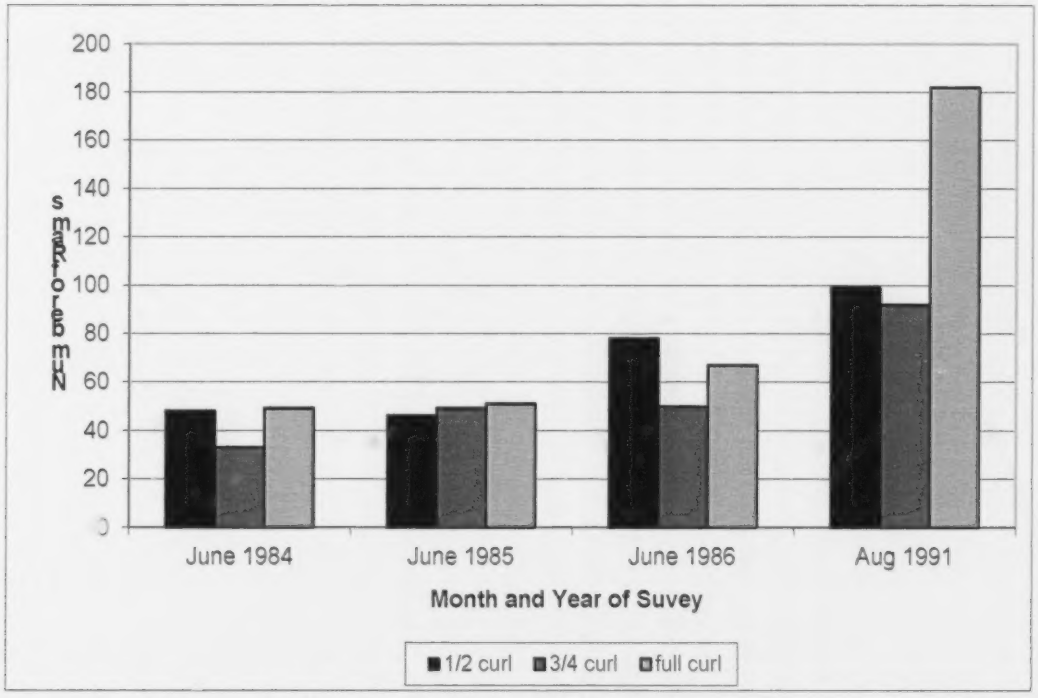

Figure 6. Number of half, three-quarter, and full curl rams in the Richardson Mountains population during years when all survey blocks were flown.

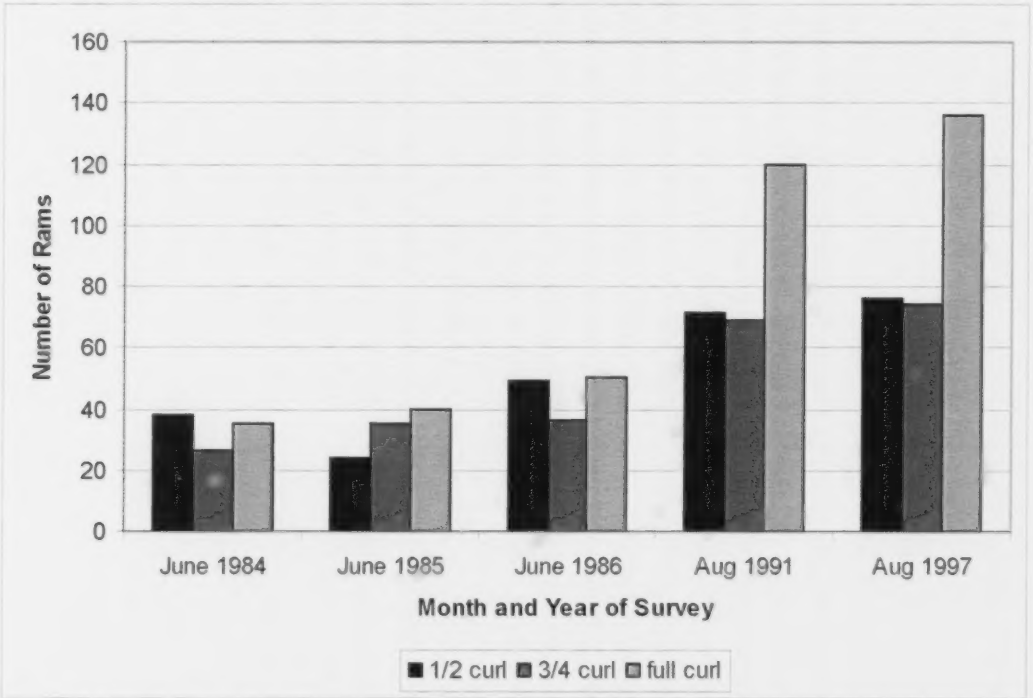

Figure 7. Number of half, three-quarter, and full curl rams in the Richardson Mountains population for blocks that were surveyed during 1997 flown.

Distribution of lambs, nursery sheep, and rams

The sites where we located lambs, nursery sheep, and rams in the Richardson Mountains during the survey are shown in Figures 8 to 11. Ninety-two percent of the sheep observed during 1997 were in the NWT. Because three blocks were not surveyed in the Yukon, the proportion of sheep in the NWT is overestimated.

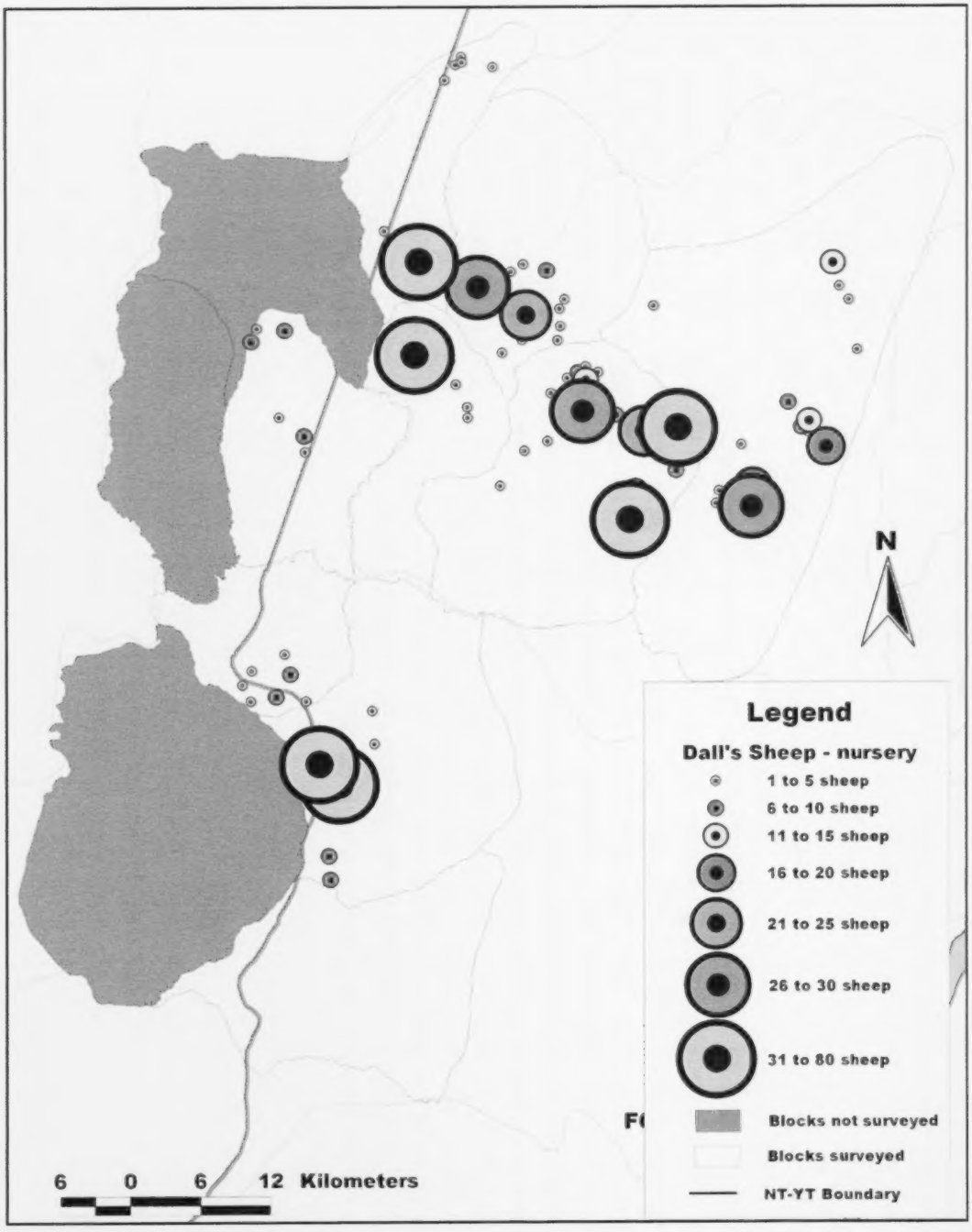

Figure 8. Distribution of nursery Dall's sheep in the northern Richardson Mountains, August 1997.

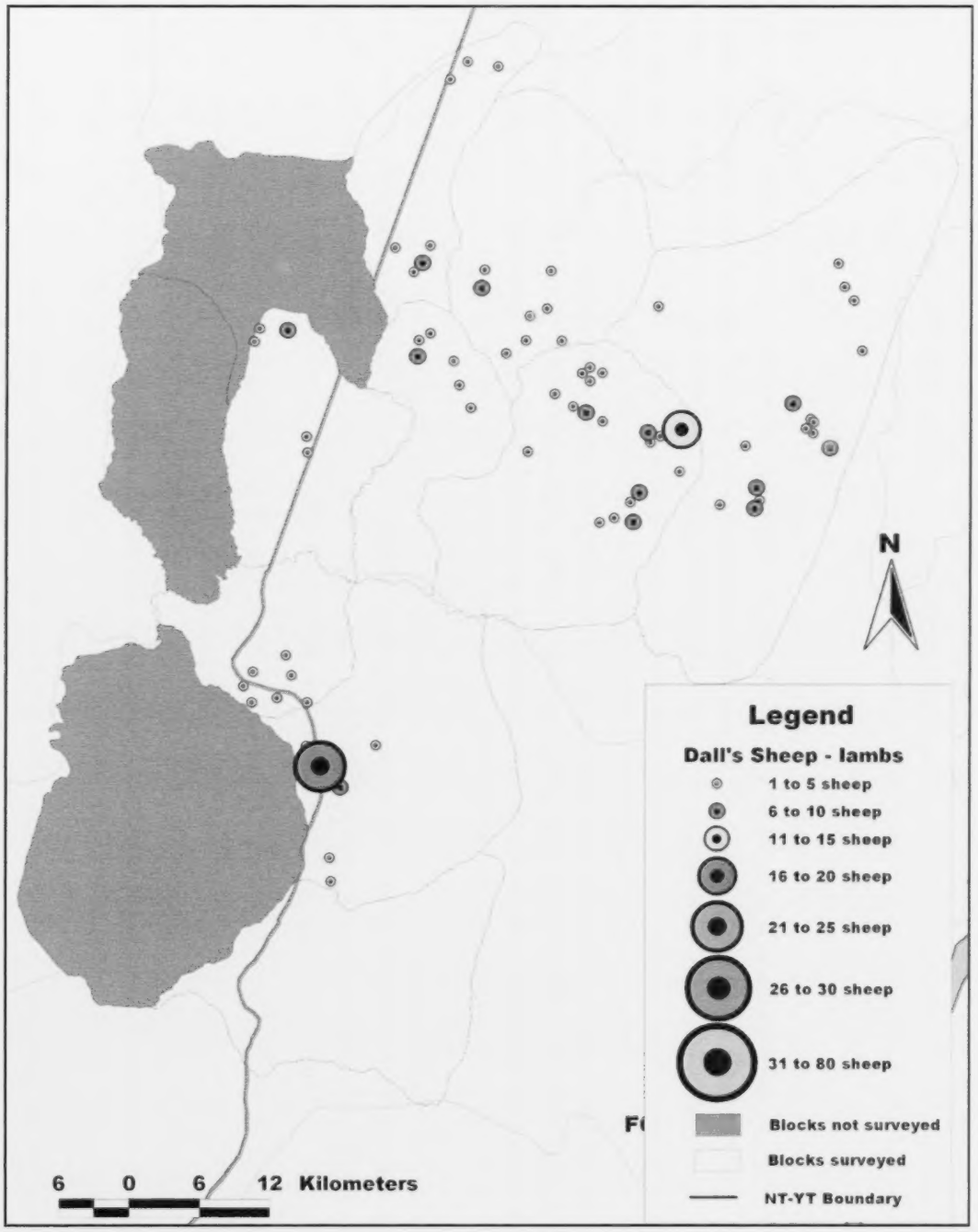

Figure 9. Distribution of lamb Dall's sheep in the northern Richardson Mountains, August 1997.

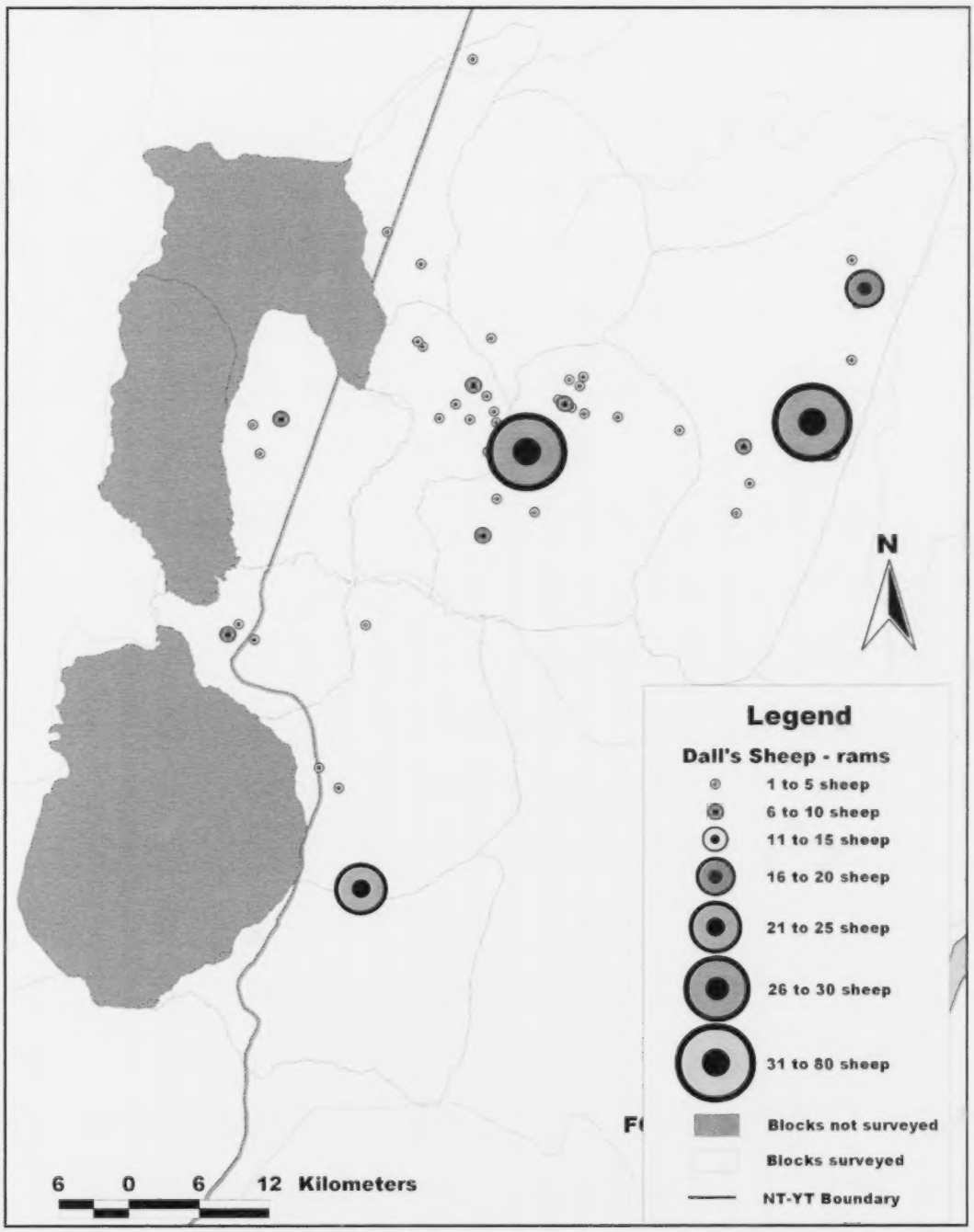

Figure 10. Distribution of ram Dall's sheep (half, three-quarter, and full curl) in the northern Richardson Mountains, August 1997.

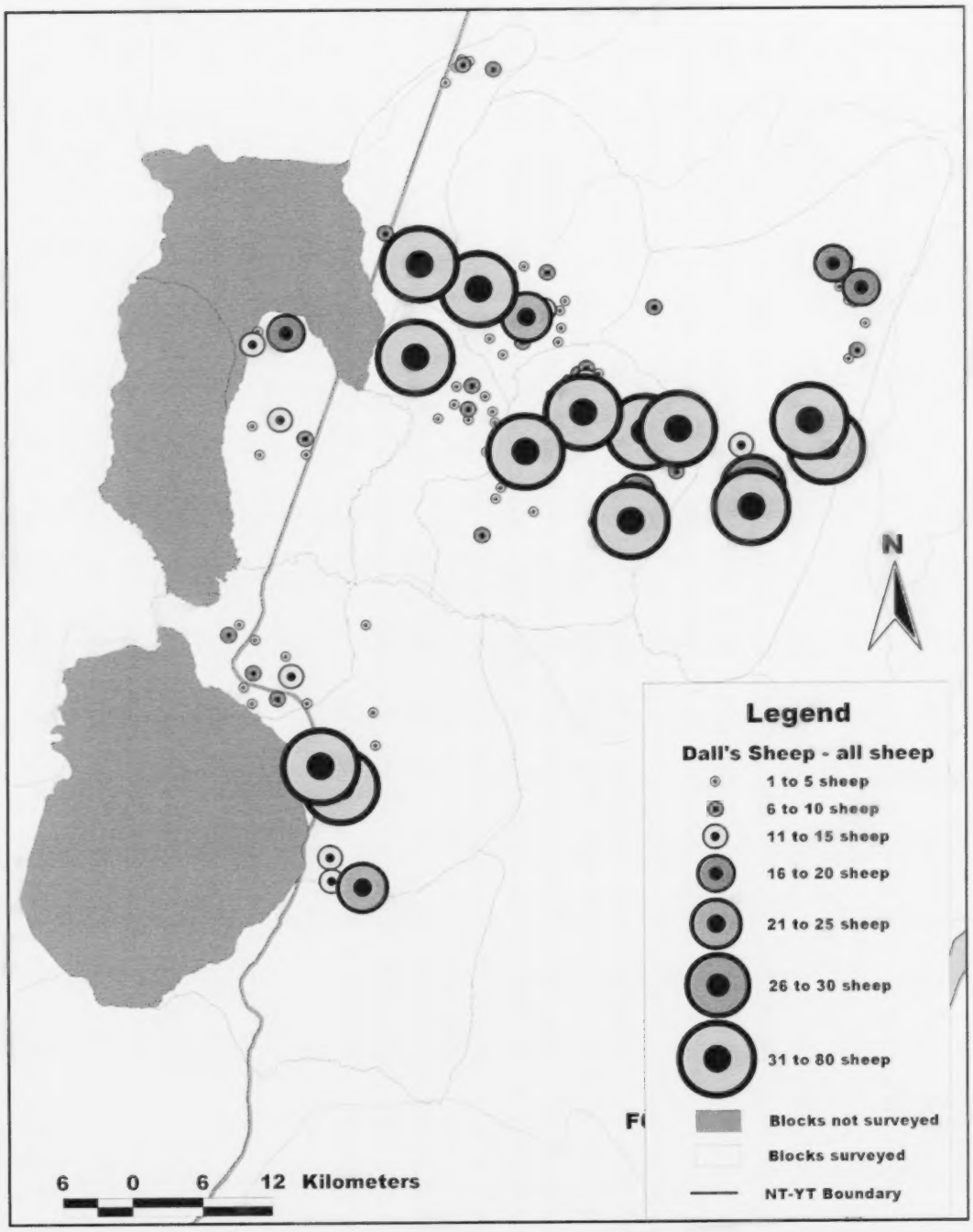

Figure 11. Distribution of Dall's sheep (nursery, lambs, and rams) in the northern Richardson Mountains, August 1997.

DISCUSSION

The Dall's sheep population in the Richardson Mountains continued to increase between 1991 and 1997, although the rate of increase has slowed. The number of lambs per 100 nursery sheep was lower than that recorded in 1991, but is consistent with those documented during 1984 to 1986. The ratio 31.2 lambs per 100 nursery sheep is indicative of a stable to increasing population. The relative proportions of half, three-quarter, and full curl rams appears to be changing, suggesting that the survivorship of young rams may be decreasing. Three blocks were not surveyed in the Yukon in 1997 due to unfavorable weather conditions. As a result we were not able to compare the distribution of lamb, nursery sheep, and rams with that recorded during 1984 to 1991.

ACKNOWLEDGEMENTS

R. Tardiff (Aklavik), F. Edwards (Aklavik), and M. Pascal (Fort McPherson) assisted as observers during the survey. D. Hanson (Canadian Helicopters) provided expert helicopter flying skills.

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APPENDIX A. Classification of Dall's Sheep by Observation Location and Survey Block in the Northern Richardson Mountains, 1 And 3 August 1997.

Survey Block	Sighting	Sub-sighting	Latitude	Longitude	Nursery Sheep	Rams					Un-classified	Total Sheep
						Lambs	Half Curl	Three-quarter Curl	Full Curl	Total		
Bear	90	1	67.90	-136.14			3	1		4		4
Bear	91	1	67.90	-136.18			2	2	5	9		9
Bear	92	1	67.90	-136.20	4	1						5
Bear	93	1	67.91	-136.23	3	2						5
Bear	94	1	67.93	-136.30	3	1						4
Bear	95	1	67.92	-136.31	9	1		1		1		11
Bear	95	2	67.92	-136.31	3							3
Bear	96	1	67.92	-136.30	1		1			1		1
Bear	97	1	67.91	-136.30	9	1						10
Bear	97	2	67.91	-136.30	13	4						17
Bear	97	3	67.91	-136.30	1	1						2
Bear	97	4	67.91	-136.30	1	1						2
Bear	97	5	67.91	-136.30	4	1						5
Bear	97	6	67.91	-136.30	4	1						5
Bear	98	1	67.87	-136.22				2	1	3		3
Bear	99	1	67.88	-136.20				1	1	2		2
Bear	100	1	67.88	-136.17	5	1						6
Bear	101	1	67.88	-136.16	4							4
Bear	101	2	67.88	-136.16			1			1		1
Bear	102	1	67.86	-136.10					4	4		4
Bear	103	1	67.88	-136.11				1		1		1
Bear	104	1	67.89	-136.12				1	2	3		3
Cache	1	1	68.14	-136.35	4	2						6
Cache	2	1	68.14	-136.42	1							1

Survey Block	Sighting	Sub-sighting	Latitude	Longitude	Nursery Sheep	Rams					Un-classified	Total Sheep
						Lambs	Half Curl	Three-quarter Curl	Full Curl	Total		
Cache	3	1	68.14	-136.40			2	1	1	4		4
Cache	4	1	68.14	-136.41	4	2						6
Cache	5	1	68.14	-136.42	3							3
Cache	6	1	67.99	-136.45	3				3	3		6
Cache	7	1	67.98	-136.42	1	1						2
Cache	8	1	67.97	-136.37	1	1						2
Cache	9	1	67.98	-136.36	3							3
Cache	9	2	67.98	-136.36	2							2
Cache	9	3	67.98	-136.36	2	1						3
Cache	9	4	67.98	-136.36	5				1	1		6
Cache	9	5	67.98	-136.36	24	4						28
Cache	9	6	67.98	-136.36	2	1						3
Cache	9	7	67.98	-136.36	6	1						7
Cache	9	8	67.98	-136.36	1	1						2
Cache	9	9	67.98	-136.36	1							1
Cache	9	10	67.98	-136.36	2		1			1		3
Cache	9	11	67.98	-136.36	1							1
Cache	10	1	67.99	-136.36	3	1						4
Cache	11	1	68.12	-136.43	4	1						5
Goodenough	32	1	67.96	-135.55	1	1						2
Goodenough	32	2	67.96	-135.55	2	2						4
Goodenough	32	3	67.96	-135.55	4	2						6
Goodenough	32	4	67.96	-135.55	1	1						2
Goodenough	33	1	67.95	-135.51	3	3						6
Goodenough	33	2	67.95	-135.51	2				7	7		9
Goodenough	33	3	67.95	-135.51	1	1						2
Goodenough	34	1	67.96	-135.51	2	1						3

Survey Block	Sighting	Sub-sighting	Latitude	Longitude	Nursery Sheep	Rams					Un-classified	Total Sheep
						Lambs	Half Curl	Three-quarter Curl	Full Curl	Total		
Goodenough	34	2	67.96	-135.51	1							1
Goodenough	35	1	67.95	-135.49	3	3						6
Goodenough	36	1	67.96	-135.50					4	4		4
Goodenough	36	2	67.96	-135.50				4	7	11		11
Goodenough	36	3	67.96	-135.50			5	4	4	13		13
Goodenough	36	4	67.96	-135.50	1		1	10	3	14		15
Goodenough	36	5	67.96	-135.50	5	1						6
Goodenough	36	6	67.96	-135.50	5	1						6
Goodenough	37	1	67.94	-135.45	8	1						9
Goodenough	37	2	67.94	-135.45	1							1
Goodenough	37	3	67.94	-135.45	6	3						9
Goodenough	37	4	67.94	-135.45					3	3		3
Goodenough	37	5	67.94	-135.45	4	2			1	1		7
Goodenough	37	6	67.94	-135.45			2			2		2
Goodenough	37	7	67.94	-135.45						5		5
Goodenough	38	1	68.01	-135.46						1		1
Goodenough	39	2	68.02	-135.45	5	2						7
Goodenough	40	1	68.04	-135.45							1	1
Goodenough	41	1	68.06	-135.50	2	1						3
Goodenough	42	1	68.06	-135.49			1	1	2	4		4
Goodenough	43	1	68.06	-135.53	3	1						4
Goodenough	44	1	68.07	-135.48			3	1	1	5		5
Goodenough	44	2	68.07	-135.48			5	1		6		6
Goodenough	44	3	68.07	-135.48			4	1		5		5
Goodenough	45	1	68.08	-135.56	5							5
Goodenough	45	2	68.08	-135.56	9	2						11
Goodenough	46	1	68.09	-135.53			1			1		1

Survey Block	Sighting	Sub-sighting	Latitude	Longitude	Nursery Sheep	Rams					Un-classified	Total Sheep
						Lambs	Half Curl	Three-quarter Curl	Full Curl	Total		
Goodenough	47	1	67.92	-135.61	3	3	1	1	2	4		10
Goodenough	47	2	67.92	-135.61			1		2	3		3
Goodenough	48	1	67.87	-135.58					1	1		1
Goodenough	49	1	67.87	-135.62	2	1						3
Goodenough	50	1	67.88	-135.63	1							1
Goodenough	51	1	67.90	-135.58	4							4
Goodenough	51	2	67.90	-135.58	1		2	2		4		5
Goodenough	52	1	67.89	-135.57	6	4						10
Goodenough	52	2	67.89	-135.57	4	3						7
Goodenough	52	3	67.89	-135.57	6	1						7
Goodenough	52	4	67.89	-135.57	1	1						2
Goodenough	53	1	67.89	-135.55	2	1						3
Goodenough	53	2	67.89	-135.55	1							1
Goodenough	54	1	67.88	-135.54	1							1
Goodenough	55	1	67.88	-135.56	3	1						4
Goodenough	55	2	67.88	-135.56	8	2						10
Goodenough	55	3	67.88	-135.56	1							1
Goodenough	55	4	67.88	-135.56	2							2
Goodenough	55	5	67.88	-135.56	3							3
Goodenough	55	6	67.88	-135.56	2							2
Goodenough	55	7	67.88	-135.56	10	5						15
Goodenough	56	1	68.00	-135.88	1							1
Goodenough	56	2	68.00	-135.88	3	2						5
Lick	16	1	67.95	-136.04	3	1						4
Lick	17	1	67.97	-136.04	1							1
Lick	18	1	67.99	-136.05	3							3
Lick	19	1	67.98	-136.06	1							1

Survey Block	Sighting	Sub-sighting	Latitude	Longitude	Nursery Sheep	Rams					Un-classified	Total Sheep
						Lambs	Half Curl	Three-quarter Curl	Full Curl	Total		
Lick	20	1	67.95	-136.11	4	2						6
Lick	21	1	67.96	-136.09	5							5
Lick	22	1	67.96	-136.10	2							2
Lick	23	1	67.97	-136.12	22	2						24
Lick	24	1	67.98	-136.09	3	1						4
Lick	24	2	67.98	-136.09	6	3						9
Lick	25	1	68.00	-136.11	7	1						8
Lick	26	1	68.00	-136.16	2							2
Lick	27	1	67.99	-136.17	2							2
Lick	28	1	67.99	-136.23	3	1						4
Lick	29	1	67.97	-136.23	6	3						9
Lick	29	2	67.97	-136.23	2	2						4
Lick	29	3	67.97	-136.23	4							4
Lick	29	4	67.97	-136.23	5	1						6
Lick	29	6	67.97	-136.23	3	1						4
Lick	29	7	67.97	-136.23	5	1						6
Lick	29	8	67.97	-136.23	1							1
Lick	30	1	67.94	-136.17				1		1		1
Lick	31	1	67.93	-136.14	1	1						2
Little Bear	128	1	67.89	-136.57	1	1						2
Little Bear	128	2	67.89	-136.57	7	3						10
Little Bear	128	3	67.89	-136.57	2	2						4
Little Bear	129	1	67.89	-136.62	2	1						3
Little Bear	130	1	67.88	-136.63	3	1						4
Little Bear	130	2	67.88	-136.63	6	2						8
Little Bear	130	3	67.88	-136.63	1	1						2
Little Bear	131	1	67.82	-136.57					1	1		1

Survey Block	Sighting	Sub-sighting	Latitude	Longitude	Nursery Sheep	Rams					Un-classified	Total Sheep
						Lambs	Half Curl	Three-quarter Curl	Full Curl	Total		
Little Bear	132	1	67.80	-136.54			1		2	3		3
Little Bear	133	1	67.83	-136.52			2	1	1	4		4
Little Bear	133	2	67.83	-136.52	1		1			1		2
Little Bear	133	3	67.83	-136.52	4				2	2		6
Little Bear	134	1	67.82	-136.46	6	4						10
Little Bear	135	1	67.81	-136.45	1	1						2
Rat	12	1	67.94	-135.97	2	2						4
Rat	12	2	67.94	-135.97	3	1						4
Rat	13	1	67.94	-135.98	6	1						7
Rat	14	1	67.93	-135.97				1	3	4		4
Rat	15	1	67.93	-135.96	8	1						9
Rat	15	2	67.93	-135.96	4	2						6
Rat	57	1	67.94	-135.94	2	2						4
Rat	58	1	67.93	-135.99	1		1			1		2
Rat	59	1	67.93	-135.97				1		1		1
Rat	60	1	67.91	-135.94	1	1						2
Rat	60	2	67.91	-135.94	5	1						6
Rat	60	3	67.91	-135.94		1						1
Rat	60	4	67.91	-135.94	3	1						4
Rat	60	5	67.91	-135.94	2	1						3
Rat	60	6	67.91	-135.94	4	1						5
Rat	60	7	67.91	-135.94	2							2
Rat	60	8	67.91	-135.94	6		1			1		7
Rat	60	9	67.91	-135.94	4	1						5
Rat	61	1	67.91	-135.97			1			1		1
Rat	61	2	67.91	-135.97	3	2						5
Rat	62	1	67.91	-135.99			1	2	4	7		7

Survey Block	Sighting	Sub-sighting	Latitude	Longitude	Nursery Sheep	Rams					Un-classified	Total Sheep
						Lambs	Half Curl	Three-quarter Curl	Full Curl	Total		
Rat	63	1	67.91	-136.00			1			1		1
Rat	64	1	67.91	-136.02	3	1						4
Rat	65	1	67.88	-135.99	1							1
Rat	66	1	67.86	-136.03			2	1	2	5		5
Rat	66	2	67.86	-136.03			4	18	8	30		30
Rat	66	3	67.86	-136.03			4	2	3	9		9
Rat	66	4	67.86	-136.03	2	2						4
Rat	66	5	67.86	-136.03			1		2	3		3
Rat	67	1	67.87	-136.03			3		8	11		11
Rat	68	1	67.88	-136.04					1	1		1
Rat	68	2	67.88	-136.04					1	1		1
Rat	68	3	67.88	-136.04					11	11		11
Rat	69	1	67.84	-136.02					3	3		3
Rat	70	1	67.83	-136.05	2							2
Rat	71	1	67.82	-136.05				1		1		1
Rat	72	1	67.79	-136.06			1	1	5	7		7
Rat	73	1	67.82	-135.97					1	1		1
Rat	74	1	67.82	-135.77	3							3
Rat	75	1	67.92	-135.75	20	8						28
Rat	75	2	67.92	-135.75	2	2						4
Rat	75	3	67.92	-135.75	1		1			1		2
Rat	75	4	67.92	-135.75	4	1						5
Rat	75	5	67.92	-135.75	3	1						4
Rat	75	6	67.92	-135.75	1	1						2
Rat	75	7	67.92	-135.75	27	6	1			1		34
Rat	76	1	67.90	-135.80	2	1						3
Rat	77	1	67.91	-135.81	24	8						32

Survey Block	Sighting	Sub-sighting	Latitude	Longitude	Nursery Sheep	Rams					Un-classified	Total Sheep
						Lambs	Half Curl	Three-quarter Curl	Full Curl	Total		
Rat	78	1	67.91	-135.78	2	2						4
Rat	78	2	67.91	-135.78	3	2						5
Rat	78	3	67.91	-135.78	3							3
Rat	79	1	67.91	-135.91	3	2						5
Rat	79	2	67.91	-135.91	5							5
Rat	80	1	67.91	-135.88	1							1
Rat	80	2	67.91	-135.88	2		1			1		3
Rat	80	3	67.91	-135.88	3		2			2		5
Rat	81	1	67.86	-135.79	14	6						20
Rat	82	1	67.85	-135.80	3	1						4
Rat	83	1	67.84	-135.82	11	3						14
Rat	84	1	67.83	-135.84	4	2						6
Rat	85	1	67.84	-135.78	20	5						25
Rat	85	2	67.84	-135.78	6							6
Rat	85	3	67.84	-135.78	5	2						7
Rat	85	4	67.84	-135.78	3	1						4
Rat	86	5	67.94	-135.96	2							2
Rat	87	1	67.89	-135.72	1	1						2
Rat	87	2	67.89	-135.72	4	1						5
Rat	87	3	67.89	-135.72	1							1
Rat	87	4	67.89	-135.72	2							2
Rat	88	1	67.90	-135.74	8							8
Rat	89	1	67.91	-135.75	2	1						3
Sheep	114	1	67.50	-136.12	8	4						12
Sheep	115	1	67.61	-136.12								
Sheep	116	1	67.50	-136.09			3	4	3	10		10
Sheep	117	1	67.50	-136.05					2	2		2

Survey Block	Sighting	Sub-sighting	Latitude	Longitude	Nursery Sheep	Rams				Un-classified	Total Sheep
						Lambs	Half Curl	Three-quarter Curl	Full Curl	Total		
Sheep	117	2	67.50	-136.05			4	3	4	11		11
Sheep	117	3	67.50	-136.05			1		7	8		8
Sheep	118	1	67.52	-136.13	2	1						3
Sheep	118	2	67.52	-136.13	1	1						2
Sheep	118	3	67.52	-136.13	6	1						7
Sheep	119	1	67.52	-136.11	4	1						5
Sheep	120	1	67.63	-136.15	1							1
Sheep	121	1	67.58	-136.13	2							2
Sheep	122	1	67.57	-136.16	5	2						7
Sheep	122	2	67.57	-136.16	2		1			1		3
Sheep	122	3	67.57	-136.16	5							5
Sheep	122	4	67.57	-136.16	14	4						18
Sheep	122	5	67.57	-136.16	4							4
Sheep	122	6	67.57	-136.16	1							1
Sheep	122	7	67.57	-136.16	1	1						2
Sheep	123	1	67.58	-136.21	3				1	1		4
Sheep	123	2	67.58	-136.21	49	21						70
Sheep	124	1	67.59	-136.25	2	1						3
Sheep	124	2	67.59	-136.25	7	3						10
Sheep	127	1	67.70	-136.22					1	1		1
Summit	105	1	67.66	-136.42				1		1		1
Summit	106	1	67.67	-136.46			2		1	3		3
Summit	107	1	67.66	-136.48				2	4	6		6
Summit	108	1	67.63	-136.40	5	3						8
Summit	109	1	67.62	-136.41	2	1						3
Summit	110	1	67.61	-136.38	2	1						3
Summit	111	1	67.62	-136.34	5	2						7

Survey Block	Sighting	Sub-sighting	Latitude	Longitude	Nursery Sheep	Rams					Un-classified	Total Sheep
						Lambs	Half Curl	Three-quarter Curl	Full Curl	Total		
Summit	111	2	67.62	-136.34	1							1
Summit	112	1	67.64	-136.33	7	4						11
Summit	113	1	67.65	-136.35	2	1						3
Summit	126	1	67.63	-136.28	1	1						2